AN ROINN TALMHAIOCHTA AGUS IASCAIGH
(Department of Agriculture and Fisheries)

FISHERY LEAFLET No. 32.

EAST COAST QUEEN FISHERY 1970.

by

K.M. BHATNAGAR.

Fisheries Division
Dublin.
1972.

INTRODUCTION

During July and August, 1970, two Isle of Man boats, equipped for fishing for queen escallops (Chlamys opercularis), were each licensed for one week by the Department of Agriculture and Fisheries to fish experimentally under the supervision of a scientist from the Department with a view to locating queen beds along the east coast. In August, a few Irish boats also fished for queens. As a result large quantities of queens were located off the Bray Bank along the east coast and substantial landings of queens were made in Ireland for the first time. This queen stock covered an area of some 2½ square miles. In the months of September, October, November and December, approximately 25 boats were engaged in the fishery and landed 26,915 cwt. of queens valued at £69,987. Some boats averaged 80-100 bags of queens per day. Most of the boats landed the queens at Howth, but some also landed at Dun Laoghaire and Wicklow. Details of the Howth landings are given in Table 1, which shows that the peak of the fishing was between 21st September and 10th November and the average catch per boat day was maximum (76 bags) between 21st September and 10th October. At first the boats were using slightly modified trawl nets but in the later part of the season several were equipped with dredging gear, which is a more appropriate method of fishing, since fishing for queens is exceedingly damaging to normal trawl materials.

This report is in two parts giving the results of (1) a Queen Survey carried out by the Department of Agriculture and Fisheries on the east coast from 12th to 18th November, 1970 and (2) an Analysis of samples taken from fishing boats during the 1970 fishing season.

(1) EAST COAST QUEEN SURVEY (12th to 18th NOVEMBER, 1970).

The survey was made from the Department of Agriculture and Fisheries research boat, Cú na Mara. An ordinary trawl net was used with the codend protected by a bottom chafer consisting of strips of scrap conveyor belt. Most hauls were of 30 minutes duration, except for hauls numbered 22 and 27 (Fig. 1) when the trawl was towed for 60 minutes in each case. The length of warp used was 75 fathom in most tows, except in hauls numbered 11 to 13. Normally, with commercial boats, the length of warps used is 3 to 3½ times the depth of the water being fished but because of the high towing speed of

Cú na Mara considerably more warp had to be used to maintain the boat on course and the trawl on the bottom. Each experimental tow was traced from Decca readings and transferred to fishing charts on which depths noted from soner readings were also recorded. Details are given in Table 2.

Fishing areas and Catch: A total of 27 hauls (Fig. 1) were made in five fishing days covering the queen grounds and other likely areas. Concentrations of queens were discovered in two new areas (Fig. 1). One such concentration was located north west of the main bed in the Kish Bank area (Hauls numbered 7, 26 and 27) and the second east of it, (Hauls numbered 8 and 18). In the first area three hauls (two of 30 minutes and one 60 minutes) yielded 40 stone of queens and in the second two 30 min. hauls yielded 9 stone (Table 2 and Fig. 1).

Fishermen believe that shell grounds are overrun in rough weather and during spring tides by brittle stars commonly known as "Wigs". This they claim causes the fouling of the fishing gear. A record of catches of brittle stars, starfishes and other marine organisms which may cause fouling of the gear was kept and this data is also presented in Table 2. At the first new location (Hauls numbered 7, 26 and 27) catches of queens were fairly clean, brittle stars being found only in small quantities, while at the other new location (Hauls numbered 8 and 18) brittle stars were abundant, which may account for the small catch.

(2) ANALYSIS OF SAMPLES

Queens were first measured and divided into 5 mm groups (Table 3 to 6). Specimens in each size group were then examined for age and gonad condition. Meat yield (muscle only) was estimated for all the fish present in each group, rather than for individual fish.

Size distribution: Table 3, giving number and percentage occurrence of queens in each mm group in the monthly samples, shows that the most dominant size group (28% to 36%) was 76 to 80 mm fish. The queens were further divided into arbitrary groupings: 'small' (41 to 55 mm), 'medium' (56 to 70 mm), 'large' (71 to 85 mm) and 'very large' (86 to 95 mm). The bulk of the catch (67% to 78%) was formed of 'large' queens throughout the fishing season (Table 3). The absence of 'small' queens examined in July and August was due to selective nature of the sample. However, during the rest of the fishing season noticeable

quantities (4% to 10%) of 'small' queens were present in the samples. Also from July to December 10% to 13% of the samples were formed of 'medium' queens.

Gonad Condition: Sexual maturity was based on seven visual conditions of the gonad, similar to the stages in escallop (Pecten maximus). Table 4 giving the gonad development observed in different size groups in October and November, 1970, shows that they do not follow any regular pattern of development as to size. Some such picture might, however, emerge after regular monthly sampling. In the samples three out of five gonads were stage IV (filling), one nearly full (stage V) and one maturing virgin. A high proportion (80%) of gonads in 41 - 45 mm groups were in advance stages of development which indicates that some queens mature sexually very early in life. All these fish had one growth ring on the shell and belonged to the 1969 year class (Table 6). For all size groups, 57.9% of the gonads were in stage IV (filling), 18.4% stage III (half full) and 11.9% stage V and VI (nearly full) and (full) respectively. Also, there were no stage VII (spent) fish observed in the samples. Not much is known about the breeding cycle of queens but their spawning season extends from January to June inclusive (Rees. 1957). Therefore, 12% (approx) in stages V and VI could be queens which would be early spawners and other stages will lead to spawning later in the season. Therefore, Table 4 should only be taken as an indication of gonad development at the time of sampling. Before and after the spawning had taken place, there would be more queens with gonads in advanced and early stages of development respectively.

Meat yield: Unlike escallops, in queens only the muscle is extracted for food to meet the market preference, even though the gonad is also edible. Table 5 shows whole weight meat ratio and meat yield per queen at different size groups during the period of the investigation. Monthly meat yields per queen varied, although in some cases the differences were insignificant (0.3 gms, at 61-65 and 66-70 size groups). The difference in meat weight may be due to the small size of the sample in some cases whilst in other some meat may have been taken off with the visera while shucking the queens. The average meat yield per queen for three months increased with the size groups from 3.0 gms at 41-45 mm to 16.6 gms at 91-95 mm. In a commercial enterprise the meat yield is either calculated as a number of queens required to yield

one pound of meat at different size groups in the samples. Queens requiring more than 50 individuals per lb of meat would appear to be unsuitable for hand processing operations.

Age Composition: Only the October to December samples were grouped together in Table 6 to show age composition. Age was assessed by the number of growth rings on the left (top) valve on which those rings are more clearly marked than on the right valve. In all the samples three and four year-old queens formed 69.4% of the total. Next in importance were the one year (15.6%) and two year (11.8%) queens respectively. Queens with 1 and 2 growth rings appeared in the 61-65 and 81-85 mm groups respectively although the numbers were small.

Figure 2 shows the percentage occurrence of 1 to 5 year old queens at different size groups. The mean lengths of 1+ and 2+ old queens were between 51 and 55 and between 71 and 75 mm respectively and for 3+ old between 76 and 80 mm. Major growth in queens, therefore, takes place in the first two years of life and slows down considerably in subsequent years.

General Conclusions: When fishing starts on a virgin stock one would expect to find a wide range of age groups, i.e. many large and old fish, accumulated in the stock over the years. As fishing develops not only the numbers but the average size of the catch would be expected to decrease. By mid November, 1970, queen catches declined as stocks became depleted and fishing for them became uneconomic. Most boats then ceased queen fishing and moved to Dunmore East for the herring fishery. Like other related shellfish, queen beds are localised and therefore they are highly susceptible to overfishing. Sufficient breeding stock must remain after fishing in order to replenish the existing stocks.

The present study of the queens from this population shows that they sexually mature very early in their life (Table 4) and their growth rate is better than average (Table 6. Fig. 2), attaining a good commercial size in 2 to $2\frac{1}{2}$ years. Replacing the small queens to the bed will benefit the fishery in two ways. Firstly, they will become the breeding stock and secondly, having spawned, they will attain by the following year a size of 65 mm and therefore will fetch a better price.

Reference:

Rees, W.J. (1957). The Scallop. Studies of a shell and its influences on humankind, pp 15 to 32.
Ed. Ian Cox. The Shell Transport and Trading Co. Ltd. (London).

Table 1. Queen landings at Howth for 1970.

Month	Date	No. of boat days	Average catch (bags)* per boat day.
August	1 - 10	1	81
	11 - 20	2	28
	21 - 31	4	21
September	1 - 10	4	36
	11 - 20	31	48
	21 - 30	73	76
October	1 - 10	92	76
	11 - 20	43	52
	21 - 31	67	43
November	1 - 10	43	28
	11 - 20	21	32
	21 - 30	7	48
December	1 - 10	13	32
	11 - 20	3	19

* Each bag contains approximately 6 stone of queens.

Table 2. Details of Queen survey in the Irish Sea during cruise of the Cú na Mara in November, 1970. F (few) = less than 1 basket, C (common) = 1 - 2 baskets. A (abundant) = more than 2 baskets.

Haul No.	Decca reading at the start of haul Green/Red	Time min.	Depth fms	Warp fms.	Catch Queens st. or no	Brittle Star	Star fish	Horse mussel	Sea urchin	Queen shell	Other shell
1.	G.I.45.0/R.I.0.5	30	17	75	36 st.	-	F	F	F	-	-
2.	G.I.46.2/R.I.0.5	30	18	75	28 st.	-	F	F	F	-	-
3.	G.I.45.0/R.I.0.5	30	17	75	26 st.	-	C	F	-	-	-
4.	G.I.45.8/R.I.0.8	30	18	75	16 st.	C	C	-	-	-	-
5.	G.I.45.2/R.I.0.5	30	19	75	18 st.	C	-	-	-	-	-
6.	G.I.44.4/R.I.1.0	30	18	75	6 st.	C	-	-	-	-	-
7.	G.I.42.5/R.I.2.0	30	20	75	16 st.	C	-	-	-	-	-
8.	G.I.41.5/R.I.1.5	30	24	75	8 st.	A	-	-	-	-	-
9.	G.I.42.2/R.I.0.0.	30	22	75	20 st.	C	-	-	-	-	-
10.	G.I.42.1/R.I.4.2.	30	17	75	4 st.	-	-	-	A	-	-
11.	G.I.43.0/R.I.4.2.	30	15	100	3 Queens	Nil	-	-	A	-	-
12.	G.I.44.4/R.I.4.0	30	14	100	14 "	Nil	C	-	A	-	-
13.	G.I.43.1/R.I.4.6	30	26	100	20 "	Nil	-	-	A	-	-
14.	G.I.42.5/R.I.4.5	30	20	100	No "	Nil	C	-	C	-	-
15.	G.I.40.9/R.I.9.6	30	15	75	10 "	F	-	-	C	-	-
16.	G.I.42.5/R.I.8.5	30	14	75	6 "	-	-	-	C	-	-
17.	G.I.45.5/R.I.0.7	30	18	75	2 st.	C	-	-	-	-	-
18.	G.I.42.0/R.I.1.5	30	21	75	1 st.	C	-	-	-	-	-
19.	G.I.38.0/R.I.1.7	30	22	75	8 Queens	-	-	C	-	F	F
20.	G.I.34.0/R.I.3.0	30	22	75	6 "	-	-	-	-	C	-
21.	G.I.31.5/R.I.3.0	30	23	75	No "	-	-	C	-	-	-
22.	G.I.47.4/R.I.4.3.	60	21	75	25 "	C	A	-	-	F	-
23.*	G.I.33.9/R.I.4.0	30	20	75	2 st.	F	C	-	C	-	-
24.	G.I.38.0/R.I.2.9	30	18	75	90 Queens	-	-	-	C	C	-
25.	G.I.35.0/R.I.3.9	30	19	75	4 st.	A	-	-	C	C	-
26.	G.I.38.2/R.J.2.8	30	19	75	12 st.	F	-	-	F	A	-
27.	G.I.39.0/R.I.2.9	60	19	75	12 st.	F	-	-	F	C	-

* Not shown on the map (Fig. 1). Tow followed 20 fathom line

Table 3. The monthly size frequency

mm Groups

Month	Total Number Examined	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-80	81-85	86-90	91-95
July	141	-	-	-	-	4	12	32	44	3	14	2
	%	-	-	-	-	2.8	8.5	22.7	31.2	23.4	9.9	1.4
August	73	-	-	-	1	4	3	11	24	22	6	2
	%	-	-	-	1.4	5.5	4.1	15.0	32.9	30.1	8.2	2.7
September					NO SAMPLE TAKEN							
October	510	-	10	15	1	13	54	111	184	96	23	3
	%	-	1.9	2.9	0.2	2.5	10.6	21.8	36.1	18.8	4.5	0.6
November	534	5	15	45	5	9	37	93	147	135	34	9
	%	0.9	2.8	8.4	0.9	1.7	6.9	17.4	27.5	25.3	6.4	1.7
December	287	-	17	20	15	5	10	39	81	72	20	8
	%	-	5.9	6.9	5.2	1.7	3.5	13.6	28.2	25.1	6.9	2.8
			Small			Medium			Large		Very large	

Table 4. Gonad condition of queens at different size groups (October and November 1970)

mm Group		Mat. Virg.	I	II	III	IV	V	VI	Total
41 - 45	No	1	-	-	-	3	1	-	5
	%	20.0				60.0	20.0		
46 - 50	No	5	3	4	7	2	-		21
	%	23.8	14.2	19.0	33.3	9.5	-		
51 - 55	No	1	18	17	8	10	4		58
	%	1.7	31.0	29.3	13.8	17.2	6.9		
56 - 60	No	-	-	4	1	1	-		6
	%	-	-	66.6	16.6	16.6			
61 - 65	No		1	1	2	3	3		10
	%		10.0	10.0	20.0	30.0	30.0		
66 - 70	No				10	29	6		45
	%				22.2	64.4	13.3		
71 - 75	No			6	25	63	15	2	111
	%			5.4	22.5	56.7	13.5	1.8	
76 - 80	No			10	31	113	22	2	178
	%			5.6	17.4	63.5	12.4	1.1	
81 - 85	No			3	26	106	13	1	149
				2.0	17.4	71.1	8.7	0.6	
86 - 90	No				4	29	4		37
	%				10.8	78.3	10.8		
91 - 95	No				2	6	2		10
					20.0	60.0	20.0		
For all groups	No	7	22	45	116	365	70	5	630
	%	1.1	3.5	7.1	18.4	57.9	11.1	0.8	99.9

Table 5. Whole weight/meat ratio and average meat yield g (grams) per queen for different size groups

	mm. Group	OCTOBER		NOVEMBER		DECEMBER			
		Whole wt./Meat wt.	Meat yield per queen	Whole wt./Meat wt.	Meat yield per queen	Whole wt./Meat wt.	Meat yield per queen	Average meat yield per queen	Number of queen required to yield 1 lb of meat
Small	41-45	-	-	7.0	3.0*	-	-	3.0	151
	46-50	5.5	3.1*	7.7	2.5	5.9	2.8	2.8	162
	51-55	5.6	3.8	5.7	4.0	6.2	3.4	3.9	116
Medium	56-60	5.4	5.0*	6.3	4.6	5.9	4.1	4.6	99
	61-65	6.2	5.0*	6.1	7.7	5.3	5.0	5.9	77
	66-70	5.1	9.0*	5.9	8.7	5.0	8.7	8.8	51
Large	71-75	5.2	11.1	5.5	10.3	5.1	9.8	10.4	44
	76-80	5.2	11.5	5.4	11.9	4.8	12.3	11.9	38
	81-85	4.7	13.9	6.1	13.6	5.0	13.5	13.7	33
Very large	86-90	5.8	17.0	5.1	16.4	5.2	15.1	16.2	28
	91-95	5.4	16.0*	6.0	15.6	5.0	13.2	16.6	27

* Small sample

Table 6. Number and percentage age distribution of Queens at different size groups. (Data from October, November and December samples only).

mm Group		Age Group (years)					
		1+	2+	3+	4+	5+	6+
41-45	No	5	-	-	-	-	-
	%	3.5					
46-50	No	36	2	-	-	-	-
	%	25.3	1.9				
51-55	No	78	1	-	-	-	-
	%	54.9	0.9				
56-60	No	19	2	-	-	-	-
	%	13.4	1.9				
61-65	No	4	9	2	-	-	-
	%	2.8	8.4	0.5			
66-70	No	-	42	12	1	-	-
	%		39.2	3.1	0.4		
71-75	No	-	46	87	12	-	-
	%		43.0	22.2	5.0		
76-80	No	-	4	190	69	-	-
	%		3.7	48.6	28.6		
81-85	No	-	1	85	119	13	-
	%		0.9	21.7	49.4	54.2	
86-90	No.	-	-	14	29	8	4
	%			3.6	12.0	33.3	80.0
91-95	No	-	-	1	11	3	1
	%			0.2	4.6	12.5	20.0
For all groups	No	142	107	391	241	24	5
	%	15.6	11.9	42.9	26.5	2.6	0.5

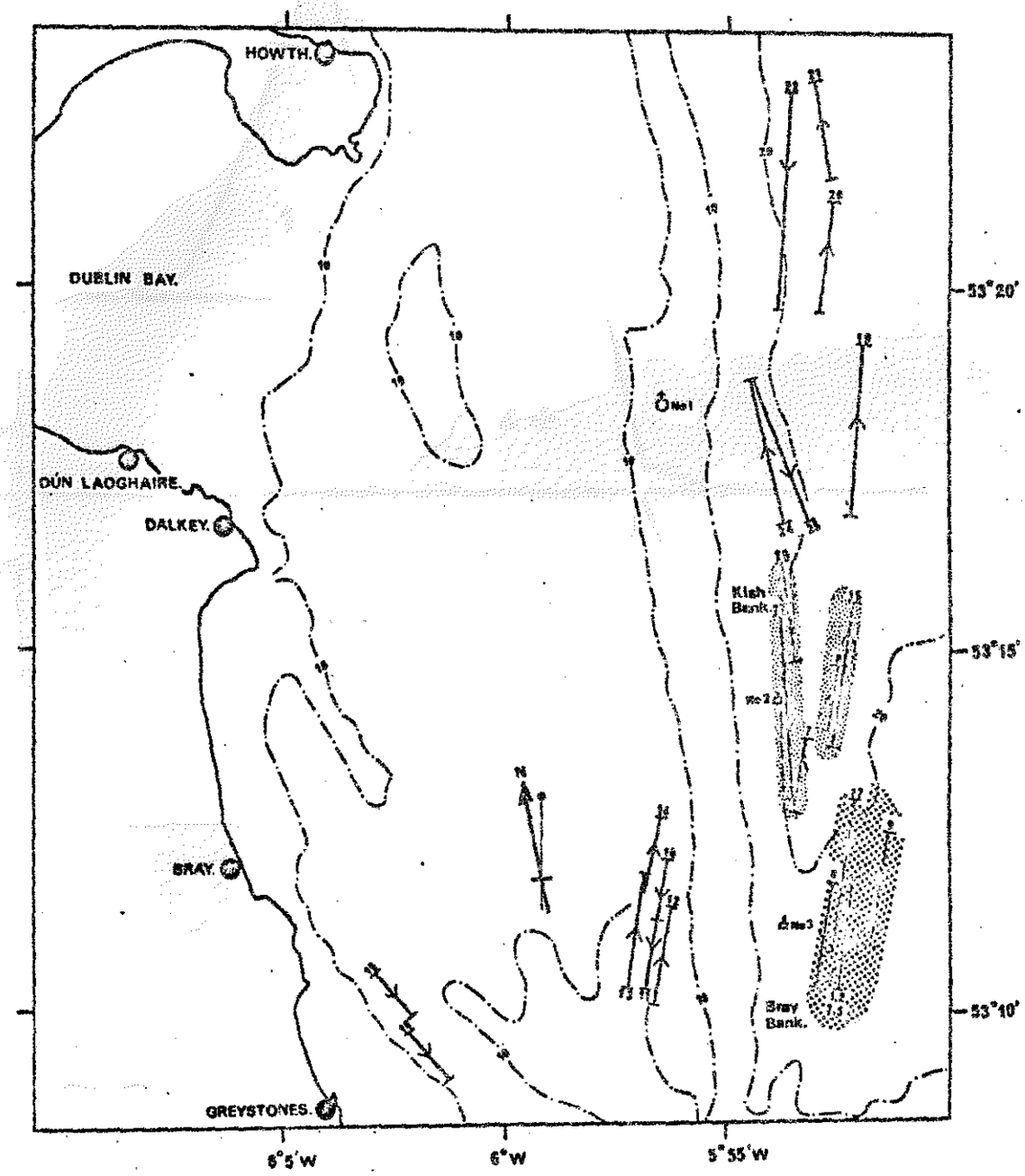

Figure 1. Area covered by the survey of 12 - 18 November, 1970. Each haul is shown by a number and the arrow indicates the direction of the haul. Area of 1970 Queen fishery shown by large dots and area where further concentrations were found by small dots.

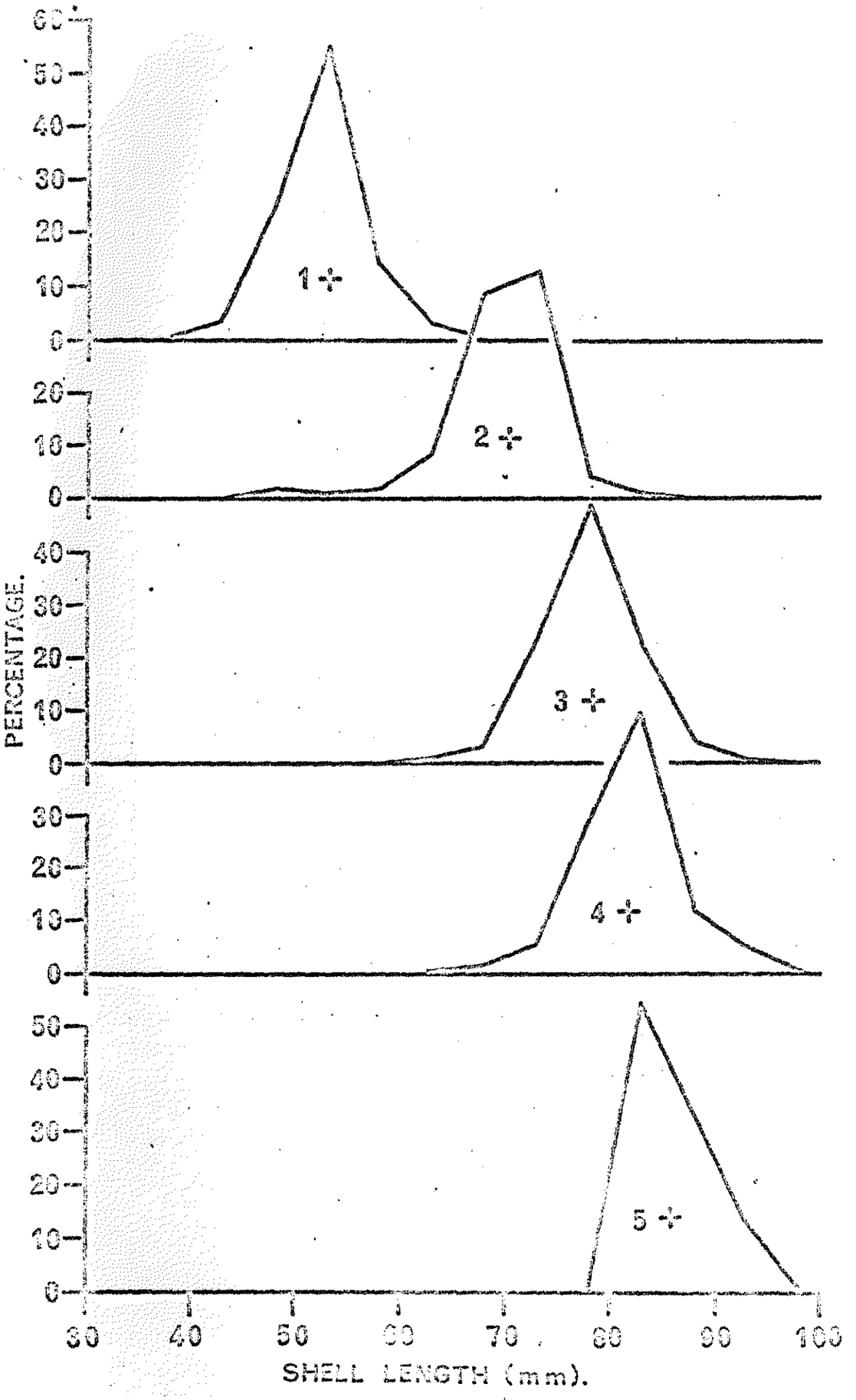

Figure 2. Percentage age distribution of 1 to 5 year old queens at different length groups.